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To trisect an angle, for example, the angle AOO , by means of this curve, produce CO to E and draw EA . Also draw OH ; then FO drawn parallel to EA makes the angle $FOO = \frac{1}{3} \angle AOO$. For since $EH = HO$, by construction of the curve, $\angle OEH = \angle EOH$. But $\angle OHA = \angle OAH = \angle OEH + \angle EOH = 2 \angle OEH$. Hence, $\angle OEH + \angle OAE = 3 \angle OEH = \angle AOO$, or $\angle OEH = \angle FOO = \frac{1}{3} \angle AOO$.

After this department, in the last issue, was in type, we received solutions of problem 299 from Professors Scheffer, Zerr, and Greenwood. Professors Scheffer and Greenwood's solutions consisted in connecting a point, G , of the ellipse with the foci F, F' . M , the middle point of FG , is taken for the center of the circle described on the focal radius, FG , as a diameter. The line AM joining M and A , the center of the ellipse, is $\frac{1}{2} F'G$, since $AF = AF'$ and M is the middle point of FG . But $\frac{1}{2} AF' = \frac{1}{2}(2a - AF) = a - \frac{1}{2} AF$, from the definition of the ellipse. Hence, MA , the distance between the centers of the auxiliary circle and the circle described on $AF = a - \frac{1}{2} AF$, the difference of their radii. Hence the circles touch.

Dr. Zerr's solution, which was analytical, made use of the same property.

CALCULUS.

228. Proposed by B. F. FINKEL, Ph. D., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

A sphere, radius r , is dropped into a conical vessel whose vertex angle is 60° . Find the contents of the vessel between the vertex and the sphere by means of the formula, $V = \iiint dx dy dz$.

Solution by G. B. M. ZERR, A. M., Ph. D., Parsons, W. Va., and the PROPOSER.

$x^2 + y^2 + z^2 = r^2$ is the equation to the sphere, and $x^2 + y^2 = \frac{1}{3}(2r - z)^2$ is the equation to the cone. Eliminating z we get $y = \sqrt{\frac{3}{4}r^2 - x^2}$.

$\therefore y = \sqrt{\frac{3}{4}r^2 - x^2} = y'$ to $y = 0$, $x = \frac{1}{2}r\sqrt{3} = x'$ to $x = 0$.

$$\begin{aligned} \therefore v &= 4 \int_0^{x'} \int_0^{y'} [2r - \sqrt{3}\sqrt{(x^2 + y^2)} - \sqrt{(r^2 - x^2 - y^2)}] dx dy \\ &= 4 \int_0^{x'} \left[r\sqrt{\frac{3}{4}r^2 - x^2} - \frac{1}{2}(r^2 - x^2) \sin^{-1} \sqrt{\frac{\frac{3}{4}r^2 - x^2}{r^2 - x^2}} \right. \\ &\quad \left. - \frac{1}{2}\sqrt{3} x^2 \log \left(\frac{\sqrt{\frac{3}{4}r^2 - x^2} + \frac{1}{2}r\sqrt{3}}{x} \right) \right] dx \\ &= 4 \left(\frac{3}{16}\pi r^3 - \frac{1}{64}\pi r^3 + \frac{1}{12}\pi r^3 - \frac{1}{6}\pi r^3 - \frac{3}{64}\pi r^3 \right) = \frac{1}{6}\pi r^3. \end{aligned}$$

229. Proposed by J. EDWARD SANDERS, Reinersville, Ohio.

Solve the differential equation $d^2y/dx^2 = axy$.

Solution by S. A. COREY, Hitsman, Iowa, and LEROY D. WELD, Coe College, Cedar Rapids, Iowa.

Let $y = c_0 + c_1x + c_2x^2 + c_3x^3 + c_4x^4 + c_5x^5 + \text{etc.} \dots (1)$.